Progress Report on Tsunami Detector Project

As of June 16, 1997, two deep ocean tsunami detection systems are nearing completion. Details of the development and construction are listed below. A full scale controlled test of one system is planned in Puget Sound during the last week of June. The first deployment cruise is planned off the RV WECOMA (Oregon State University research ship) cruise from Dutch Harbor, Alaska, on July 14, with the installation of one tsunami detector off Alaska and another off the Washington coast reporting data in near real time to the warning centers through the GOES satellite system.

1. Completed the main CPU board based on a Motorola 68332 microprocessor that will be used in the new tsunami sensor and on the surface buoy. This board has gone through extensive testing and evaluation resulting in three revisions from the original design.
2. Designed a PCMCIA board and interface electronics that will be the mass storage unit for the new tsunami sensor. The board uses a 40 MB Intel flash memory PC card, which will replace the hard disk drives used in the earlier versions of the sensor.
3. The counter board for the PAROS sensor has been redesigned to operate with very low power for long term deployments. A second and final version of the printed circuit board is being fabricated. PC based software was written to rapidly decode and display data.
4. A GOES transmitter has been purchased and tested on self-timed and random reporting modes. Antenna and detector tests have been underway, and the random return remains at 100% with a delay of message through NESDIS dial-up modem of less than 1 minute.
5. A prototype Web page was developed which takes data from the GOES dial-up modem and displays it in near real-time in a simulation mode.
6. A test of the acoustic modems was completed during the week of March 10 in Puget Sound, followed by a test from the MOANA WAVE near Hawaii during 24-25 March. The tests quantified the signal to noise values and the effective range of the modem. To achieve reliable communication from the sea floor to the buoy, an increase in the bottom power output by 10 dB was determined necessary. Work is underway by the manufacturer to make the necessary modifications, including software modifications for improvements to the communications protocol.
7. Software to detect a tsunami and make the appropriate response has been developed and installed in the tsunami sensor. Additional testing is underway to verify and evaluate its performance with simulated data.
8. A combination of random reports and modified self-timed transmissions has been developed for the tsunami response.
9. Software for the surface buoy is under development. The complex timing and protocol issues are being carefully addressed. Extensive testing of each module is underway which is a very time consuming activity.
10. Instrument housings for the buoy and subsurface sensors, instruments, and batteries are

being fabricated. Cables, connectors, lights, and batteries have been ordered.

11. Two 2.5 m disc buoys, including towers, bridles, internal metalwork, instrument wells, and ballast weights have been designed and are being fabricated at several outside shops. The moorings have been designed and hardware is being fabricated in-house.
12. A Direct Readout Ground Station capability for PTWC using an existing NWS GOES dish is being evaluated.

HOW HAWAII INTENDS TO USE TSUNAMI DETECTOR DATA IN REAL TIME

1. To discriminate whether the subduction earthquake under consideration during a tsunami watch or warning is a tsunami earthquake or not.

A. Ocean bottom topography around epicenter
B. Is epicenter near the trench?
C. Wave height of tsunami reported by tsunami detector.

2. Calculation of moment magnitude by tsunami data
(For tsunami earthquake, moment magnitude by seismic data may be dangerously deceptive.)

A. Outline tsunami source using tsunami sensor data and nearby tide gage data
B. Source area major axis length gives moment magnitude
C. Tsunami height recorded by bouy gives another estimate of magnitude

3. Forecast of expected wave heights in Hawaii, beach by beach

A. First, forecast expected wave height in Hilo
    Use moment magnitude by tsunami measurement.
C. Forecast beach by beach
    Use empirical method developed for Hawaii from historical data.
    Computer program has been worked out